AF/2100 #

Xerox Docket No. D/99646

PATENT APPLICATION

#9
9-20-03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of

Ramesh NAGARAJAN et al. — On Appeal from Group: 2623

Application No.: 09/488,572 — Examiner: Jingge Wu

Filed: January 21, 2000 — Docket No.: 104422

For: DATA PROCESSING METHODS AND DEVICES FOR SEGMENTATION OF AN IMAGE

APPEAL BRIEF TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Attached hereto are three (3) copies of our Brief on Appeal in the above-identified application.

The Commissioner is hereby authorized to charge Deposit Account No. 24-0037 in the amount of Three Hundred Twenty Dollars ($320.00) in payment of the Brief fee under 37 C.F.R. 1.17(f). In the event of any underpayment or overpayment, please debit or credit our Deposit Account No. 24-0037 as needed in order to effect proper filing of this Brief.

For the convenience of the Finance Division, two additional copies of this transmittal letter are attached.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Jon F. Hadidi
Registration No. 46,427

JAO:JFH/cmf
Date: August 25, 2003

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 24-0037

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of:

Ramesh NAGARAJAN et al.

Application No.: 09/488,572

Filed: January 21, 2000 Docket No.: 104422

For: DATA PROCESSING METHODS AND DEVICES FOR SEGMENTATION OF AN IMAGE

BRIEF ON APPEAL

Appeal from Group 2623

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400
Attorneys for Appellants

TABLE OF CONTENTS

I. INTRODUCTION

This is an appeal from an Office Action mailed April 11, 2003, finally rejecting claims 1-5 of the above-identified patent application. Claims 6-9 are allowed.

A. Real Party In Interest

The real party in interest in the present application is XEROX CORPORATION, by way of an assignment recorded at Reel 010566, Frame 0476.

B. Statement of Related Appeals and Interferences

There are presently no appeals or interferences known to Appellant, Appellants' representative or the Assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

C. Status of Claims

Claims 1-9 are pending. Claims 6-9 are allowed. Claims 1-5 stand finally rejected and are on appeal. Claims 1 is an independent claim. Claims 2-5 are dependent claims. Claims 2-3 depend directly from claim 1, and claims 4-5 depend indirectly from claim 1. Claims 4-5 depend directly on claim 2.

Claims 1-5 stand or fall together.

D. Status of Amendments

The Amendment filed March 6, 2003 is the last Amendment which has been entered. Claims 1 and 6 are amended in the March 6, 2003 Amendment. Claims 2-5 and 7-9 are originally filed claims, which have not been amended. All amendments have been entered.

No Amendment After Final Rejection was filed. Rather, in view of the result of a Personal Interview which was conducted with the Examiner on June 5, 2003, a Notice of Appeal was directly filed in response to the April 11, 2003 Final Rejection.

E. Interview with Examiner

A Personal Interview was conducted with the Examiner on June 5, 2003. The interview summary reads: "Applicant states that FIG. 5 of Robinson illustrates that changing

parameters are done by changing modes. Examiner disagrees. Examiner believes that Robinson discloses that user can select modes and then change options or submodes as well as parameters for the selected mode."

II. SUMMARY OF THE INVENTION AND APPLIED REFERENCES

A. The Claimed Invention

The segmentation of an image is the division of the image into portions or segments that are independently processed. For example, some segments may relate to text and other segments may relate to images. The segments that relate to text will be processed, for example, to improve the rendering of high contrast. In contrast, the segments that relate to images will be processed, for example, to improve the rendering of low contrast.

Conventionally, the settings or parameters relating to each segment class in an automatic mode are predetermined. In such conventional systems, the user of a scanner or copier system implementing a segmentation mode is not allowed to change the automatic mode settings or parameters. The settings relating to the tone reproduction curves (TRCs), the filters, and/or the rendering methods are thus fixed for the automatic segmentation mode.

However, for various reasons, a user could be interested in adjusting the automatic mode settings and parameters, for example to conform to a specific rendering of data to the user's own esthetic choices.

The data processing methods and devices recited in claims 1-5 allow a user to change data processing settings within an automatic segmentation mode.

In exemplary embodiments, when selecting an automatic segmentation mode for processing an image, the user will have the flexibility to change all data processing settings (such as, for example, tone reproduction curve, filter and rendering methods) for certain types of segments. The image will then be processed with the user-specified settings.

For example, referring to Figure 2, the image processing circuit 230 performs image processing, and includes at least an automatic segmentation mode in which an image is

divided into segments relating to segment classes and the segments are independently processed based on the segment class to which they belong. The memory 240 stores defined parameter values for at least a subset of the set of segment classes. The parameter manager 250 allows a user to control the parameter settings for an automatic segmentation mode used by the data processing system 200 to process one or more of the defined sets of data received from one or more of the input devices 245 or the network 255. The parameter manager 250 also controls the relationship between parameter values of subclasses based on the parameter values of main classes for the automatic segmentation mode.

In operation, a user can provide instructions through either one or both of the network 255 and the one or more input devices 245. The user can provide a request for setting new values for one or more parameters used in the automatic segmentation operating mode. When the user provides this request, the parameter manager 250 searches the current parameter values for the main classes in the memory 240. Thus, the display manager 270 displays the current parameter values using, for example, one or more graphical user interfaces.

The user thus provides at least one new parameter value for one or more of the parameters relating to one or more of the main classes. Each new parameter value is input using one of the input devices 245 or the network 255. The parameter manager 250 stores the new parameter values in the memory 240.

Next, either after the new parameter values have been stored in the memory 240 or upon a defined set of data to be processed by using the automatic segmentation mode being received, the parameter manager 250 determines the parameter values of one or more parameters relating to one or more subclass based on parameter values of parameters relating to one or more main class.

In the disclosed embodiments, as set forth in the following discussion, there are 4 main segmentation classes: Text and Line Art, Photo/Contone, Coarse Halftone and Fine

Halftone. In such exemplary embodiments, there are 4 parameters that need to be set for each of the 4 main classes: rendering method, filtering, tone reproduction curve and screen modulation. In the Text and Line Art class, the user has two choices for the rendering method, error diffusion and thresholding. Error diffusion is a binarization method that tries to preserve the average graylevel of an image within a local area by propagating the error generated during binarization to pixels that are yet to be processed.

The filtering method can be chosen to be either sharpen or descreen. The sharpness or descreen level value is chosen by the user. The user can select any one of 4 tone reproduction curves for the Text and Line Art class segment. The 4 tone reproduction curve choices include high contrast, medium-high contrast, medium contrast and low contrast. The screen modulation setting is used in conjunction with the hybrid screen rendering method and therefore does not apply for the Text and Line Art class.

In the Photo/Contone class, the user has three choices for the rendering method: error diffusion, hybrid screen and pure halftoning. In the hybrid screen method, the input image data is first modulated with the screen data and an error diffusion method is applied to the data resulting data from the first modulation. When 100% of the screen is applied for modulating the input data, the hybrid screen method is very close to pure halftoning. When 0% of the screen is applied, the hybrid screen method exactly matches the output of error diffusion.

The filtering method can be chosen to be either sharpen or descreen. The sharpness or descreen level value is chosen by the user. The user can select any one of 4 tone reproduction curves for the Photo/Contone class segment. The four tone reproduction curve choices include high contrast, medium-high contrast, medium contrast, low contrast. The screen modulation setting is used in conjunction with the Hybrid screen rendering method only. The screen modulation setting allows the user to choose a setting between 100% and

0%. The screen modulation setting indicates the relative percentages of error diffusion and halftone to be used in the hybrid screen rendering method.

In the coarse halftone class, the user has four choices for rendering method, error diffusion, hybrid screen, pure halftoning and thresholding. The filtering method can be chosen to be either sharpen or descreen. The sharpness or descreen level value is chosen by the user. The user has the option of selecting any one of four tone reproduction curves for the Coarse Halftone class segment. The four tone reproduction curve choices include high contrast, medium-high contrast, medium contrast, low contrast. Again, the user can set the value for the screen modulation setting when the hybrid screen rendering method is selected.

In the Fine Halftone class, the user has three choices for the rendering method: error diffusion, hybrid screen and halftone screen. The filtering method can be chosen to be either sharpen or descreen. The sharpness or descreen level value is chosen by the user. The user has the option of selecting any one of four tone reproduction curves for the Fine Halftone class segment. The four tone reproduction curve choices include high contrast, medium-high contrast, medium contrast, low contrast. Again, the user can set the value for the screen modulation setting when the hybrid screen rendering method is selected.

In the exemplary embodiment shown in Figs. 3 and 4, the user is provided with the four main segmentation classes in the system, "Text & Line Art", "Photo/Contone", "Coarse Halftone" and "Fine Halftone". The user is given the option of changing the rendering method, the screen modulation, the filtering and the tone reproduction curve (TRC) which will be used to process segments of defined sets of data, for each of the four main segmentation classes.

The subclasses are classes that are used to transition between the four main classes. For example, the user-specified rendering method parameter values for the text class will be used as the starting point for slowly transitioning the rendering method across some of the subclasses, to the user-specified rendering method for the coarse halftone class. Filter

weightings will be slowly changed in order to transition from one main class filter parameter value to the neighboring main class filter parameter value.

Likewise, each of the possible two tone reproduction curve selections will be weighted as the classes transition from one main class to the neighboring main class. In this way, automatic segmentation mode parameter values can be changed by the user without introducing abrupt visual transitions between segmentation classes. This also provides ease of use, in addition to flexibility for the user, since the user will not have to have advanced knowledge about each of the segmentation subclasses in order to take advantage of the advanced data processing features of the system.

B. <u>The Applied Reference</u>

Robinson provides a technique for controlling an image processing arrangement to minimize the misclassification of predetermined image types in a document with a plurality of predetermined image types. Robinson provides an image processing apparatus for segmenting an input image using one of a plurality of fixed modes. The image is represented by image-related signals comprising a plurality of pixels with a plurality of corresponding image intensity signals. A selected one of the image intensity signals corresponding with a first predetermined image type is processed in parallel by an image type determining arrangement, a first image processing module, and a second image processing module. The first image processing module is used to buffer the plurality of the image intensity signals and is pre-programmed to process images of the first predetermined image type, while the second image processing module is used to buffer the plurality of the image intensity signals and is pre-programmed to process images of a second predetermined image type.

Referring to FIG. 1, an image input processing arrangement for handling image data is designated by the numeral 100. The stream of image pixels from an image data input is fed to a data buffer 101. The data buffer 101, which comprises any suitable commercially available serial in/serial out multi-row buffer having a bit storage capacity sufficient to

temporarily store lines of image pixels, permits processing of image data in blocks of several lines. While the arrangement 100 is used to classify image data on a pixel-by-pixel basis, as will appear, the image type of a given pixel can be made by reference to a plurality of pixels, e.g. a block of image pixels.

Image data is made available to the image processing system along a data bus 102. Image data at this point is in its raw gray scale format such as, for example, 6-8 bits per pixel. To detect the presence of high frequency halftone image data, a one-dimensional block of image pixels is unloaded from the buffer 101 onto the data bus 102. The block of image pixels is passed to halftone detector 104, which auto correlates each pixel group in accordance with a predetermined algorithm to determine if the image data contains halftones or not. An output on a signal line 106 instructs the image processing control 108 to handle the data in accordance with whether high or low frequency halftone image data has been detected. A suitable block size is 16 pixels at a time at 400 spots/inch, or 12 pixels at a time at 300 spots/inch. Too large a sample size has a tendency to cause a blurred result, while too small a sample size does not contain a large enough amount of data for a good sample of the function. Either case results in inaccuracies in detecting halftone image data.

The presence of line copy and/or continuous tone data is determined by a discriminator 110. The discriminator 110 produces an output on a signal line 112 indicative of the presence of line copy or continuous tone image data, instructing the image processing control 108 to handle data in accordance with the output on line 112.

The image processing control 108 serves essentially as a switch to allow data from the image processing sections, including the high frequency halftone processing section 114, the low frequency halftone processing 116, the line image processing section 118 and the continuous tone processing section 120, to flow through a data bus 122 to an output buffer 126 in accordance with the detection of data in the particular mode. The image processing control 108 controls the data bus 122 to allow data flow from each processing section, in

accordance with the signals passed to the image processing control 108 from the halftone detector 104 or the discriminator 110. Each processing section processes any detected appropriate image data in accordance with its function, but only that data that is appropriately processed is allowed to pass to a selector 124 and then to an output buffer 126. Data improperly processed is discarded

Operation of the arrangement 100, in a "full" segmentation mode, is explained with reference to FIG. 2. If, at step 130, it is determined that an image type is a halftone, then the autocorrelator 104 determines, via step 132, whether the halftone is high or low frequency. If the halftone is high frequency, then a descreen filter, a tone reproduction curve and a halftone filter are preferably applied via steps 134, 136 and 138. If, on the other hand, the halftone is low frequency, and sharpness is engaged (step 140) then an enhancement filter, a tone reproduction curve and a threshold are applied via steps 142, 144 and 146. When sharpness is not engaged, step 142 is omitted.

If, at step 130, it is determined that the image type is not a halftone, then the discriminator 110 determines, via step 150, whether image type is line copy or continuous tone. If it is determined that line copy is present, then the image data is processed with steps 152, 154, 156 and 158 in a manner similar to that used for low frequency halftones, as discussed above. If it is determined that continuous tone is present, then the image data is processed with steps 160 and 162 in a manner similar to that used for high frequency halftones, as discussed above, except that a descreen filter is not applied.

The control section (image processing control 108) serves to map the outputs of the first and second image processing modules (the auto correlator 104 and the discriminator 110, respectively) with control signals so that pixels of the selected image type are delivered to the output section (output buffer 126) in accordance with one of the selected modes. This mapping function is accomplished through the use of a plurality of look-up tables. That is, each time the control section determines that a given predetermined image type is present in a

region of the input image, it looks to a selected one of the look-up tables to decide which of the corresponding first or second image processing modules, which are pre-programmed to process only one particular predetermined image type, should be coupled to the output section.

III. THE ISSUE ON APPEAL

Whether, under 35 USC §102(b), the Examiner has established that claims 1-5 are unpatentable over U.S. Patent No. 5,339,172 to Robinson.

IV. LAW

A. 35 U.S.C. §102(B)

Several basic factual inquiries must be made in order to determine whether there is anticipation of the claims of a patent application under 35 U.S.C. §102(b). These factual inquiries are set forth in In re Bond, 910 F.2d 831, 832 (Fed. Cir. 1990):

> For a prior art reference to anticipate in terms of 35 U.S.C. §102, every element of the claimed invention must be identically shown in a single reference . . . .

(Citations omitted; Emphasis added.) See also, PPG Industries, Inc. v. Guardian Industries Corp., 75 F.3d 1558, 1566 (Fed. Cir. 1996) wherein the court stated in relevant part:

> To anticipate a claim, a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter.

(Emphasis added.)

Appellants respectfully submit that claims 1-5 are not anticipated by Robinson because Robinson fails to disclose or teach changing at least one automatic segmentation parameter of a selected segmentation mode, and the other features recited in the claims.

V. ARGUMENT

A. Claims 1-5 are not Anticipated by Robinson

Claims 1-5 stand rejected under 35 USC §102(b) as anticipated by U.S. Patent 5,339,172 to Robinson.

Independent claim 1 recites: "A method for segmenting an image comprising: determining a selected segmentation mode to be used when segmenting the image; determining if the selected segmentation mode is an automatic mode; determining, if the selected segmentation mode is the automatic mode, whether a user wishes to change at least one automatic segmentation parameter of the selected mode; inputting a new value for each at least one automatic segmentation parameter to be changed, if the user wishes to change at least one automatic segmentation parameter; and segmenting the image using the automatic segmentation parameter values, including any new automatic segmentation parameter values."

The Final Rejection, mailed April 11, 2003, alleges that Robinson teaches "determining, if the selected segmentation mode is the automatic mode, whether a user wishes to change at least one automatic segmentation parameter of the selected mode" as recited in claim 1. The Final Rejection states: "Robinson clearly show[s] that the user can change the at least one automatic segmentation parameter by choosing one of the plurality of LUTs [look-up tables] when the user selects [an] automatic segmentation [mode] (sic)" specifically citing Figures 1 and 5, and column 8, line 5 through column 9, line 44 for support. The Final Rejection further alleges that step 198 of Figure 5 "explicitly mentions selecting a new sub-mode and new parameters under the selected automatic mode and also the user can change parameters in luts [look-up-tables] by [choosing] (sic) one lut from a plurality of luts."

Applicants respectfully disagree with these allegations. Figure 5 of Robinson is a flow diagram illustrating a technique for setting the segmentation mode. An operator selects a start icon (step 184), and is presented with various options (step 186). The various options or segmentation modes are designated by the variable N(i). For example, Screen mode is designated as option N(1), Threshold mode as N(2), and so on. Steps 188-1, 188-2, . . . 188-M, illustrate that the user can choose a segmentation mode from one of m segmentation

modes. Upon choosing one of the segmentation modes (step 190), appropriate parameters for obtaining the mapping function, which are predetermined and are fixed, and which are stored in one of m look-up tables for the selected segmentation mode, are downloaded to segmentation control 180 of Figure 1. The user had no discretion on this process. Once any given segmentation mode is related, the particular look-up table associated with the mode is variably selected, and the user has no ability to either vary the look-up table that is related as a result of that segmentation mode being selected or to vary the specific values stored in the selected look-up table.

As image data is transmitted to the segmentor 100 (step 192), classifications are made in accordance with the downloaded parameters of segmentation control 180 (step 194). To verify the quality of the image processing, proofs can be made (step 196) and if print quality is acceptable (step 198), then the process is ended; otherwise, a new segmentation mode is chosen (step 200) and the process is repeated. See Robinson, Figures 1, 4, and 5, column 3, lines 56-57 and column 9, lines 25-44.

The text describing Fig. 5 of Robinson clearly states that changing the variable N(i) changes only the selected segmentation mode, and does not result in any of the predetermined parameter values in any of the m look-up tables corresponding to the selected mode being changed in any way from the predetermined values. Moreover, applicants respectfully submit the print quality determining step 198 does not use or need segmentation parameter values stored in the look-up tables, as step 198 simply queries the user to determine if the print quality is acceptable, so that, if it is not, a different segmentation mode, not any different values for parameters of that segmentation mode, can be selected.

Furthermore, the Final Rejection's assertion that a user can change parameters in look-up tables by choosing one look-up table from a plurality of look-up tables is entirely unfounded, unsupported, and is directly contrary to the teaching of Robinson. The Final Rejection's cited text, column 8, line 5 to column 9, line 44 describes how modes are changed

using pre-stored parameters stored in look-up tables corresponding to particular segmentation modes. Applicants respectfully submit that changing segmentation modes is not equivalent to changing a parameter within a mode once the mode is selected.

Therefore, Robinson fails to determine, if the selected segmentation mode is an automatic mode, whether a user wishes to change at least one automatic segmentation parameter of the selected mode, as recited in claims 1-5. Since Robinson fails to anticipate changing an automatic segmentation parameter of a selected segmentation mode, then Robinson also fails to input a new value for each at least one automatic segmentation parameter to be changed, if the user wishes to change at least one automatic segmentation parameter. Robinson also fails to segment the image using the automatic segmentation parameter values, including any new automatic segmentation parameter values, as further recited in claims 1-5.

Similarly, since Robinson fails in any way to describe, teach, or suggest allowing the user (or anything else) to input one or more new automatic segmentation parameter values, Robinson also fails to teach or disclose altering, if at least one new automatic segmentation parameter value is input, at least one other automatic segmentation parameter value, as recited in claim 2; storing the at least one new automatic segmentation parameter value, as recited in claim 3; storing the at least one new automatic segmentation parameter value and the at least one other automatic segmentation parameter value, as recited in claim 4; and storing the at least one new automatic segmentation parameter value and alter the at least one other automatic segmentation parameter value each time the automatic segmentation mode is selected, as recited in claim 5.

VI. CONCLUSION

The applied reference, Robinson, fails to disclose all the features of claims 1-5. Thus, Robinson fails to anticipate the subject matter of claims 1-5 under 35 U.S.C. §102(b). Thus, claims 1-5 are patentable over the applied reference.

The Honorable Board is requested to reverse the rejections set forth in the Final Rejection and to return the application to the Examiner to pass the application to issue.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Jon F. Hadidi
Registration No. 46,427

JAO:JFH/ale

Enclosure:
Appendix of Claims

Date: August 22, 2003

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 24-0037

APPENDIX A

CLAIMS:

1. (Previously Amended) A method for segmenting an image comprising:

determining a selected segmentation mode to be used when segmenting the image;

determining if the selected segmentation mode is an automatic mode;

determining, if the selected segmentation mode is the automatic mode, whether a user wishes to change at least one automatic segmentation parameter of the selected mode;

inputting a new value for each at least one automatic segmentation parameter to be changed, if the user wishes to change at least one automatic segmentation parameter; and

segmenting the image using the automatic segmentation parameter values, including any new automatic segmentation parameter values.

2. (Original) The method of claim 1, further comprising altering, if at least one new automatic segmentation parameter value is input, at least one other automatic segmentation parameter value.

3. (Original) The method of claim 1, further comprising storing the at least one new automatic segmentation parameter value.

4. (Original) The method of claim 2, further comprising storing the at least one new automatic segmentation parameter value and the at least one other automatic segmentation parameter value.

5. (Original) The method of claim 2, further comprising storing the at least one new automatic segmentation parameter value and altering the at least one other automatic segmentation parameter value each time the automatic segmentation mode is selected.

6. (Previously Amended) A method for segmenting an image comprising:

determining a selected segmentation mode to be used when segmenting the image;

determining if the selected segmentation mode is an automatic mode;

determining, if the selected segmentation mode is the automatic mode, whether a user wishes to change at least one automatic segmentation parameter of the selected mode;

inputting a new value for each at least one automatic segmentation parameter to be changed, if the user wishes to change at least one automatic segmentation parameter; and

segmenting the image using the automatic segmentation parameter values, including any new automatic segmentation parameter values;

altering, if at least one new automatic segmentation parameter value is input, at least one other automatic segmentation parameter value,

wherein each one of the at least one automatic segmentation parameter to be changed correspond to a segmentation class in a first subset of a set of segmentation classes and each one of the at least one other automatic segmentation parameter value to be altered correspond to a segmentation class in a second subset of the set of segmentation classes.

7. (Original) The method of claim 6, wherein at least one segmentation parameter value of each class of the second subset is linked to at least one segmentation parameter value of a class of the first subset.

8. (Original) The method of claim 7, wherein at least one segmentation parameter value of each class of the second subset is derived from the at least one segmentation parameter value of a class of the first subset.

9. (Original) The method of claim 8, wherein at least one segmentation parameter value of each class of the second subset is a weighted average of the at least one segmentation parameter value of a class of the first subset.